

### Abstract of the Disclosure

A method of forming a SiGe layer having a relatively high Ge content includes preparing a silicon substrate; depositing a layer of SiGe to a thickness of between about 100 nm to 500 nm, wherein the Ge content of the SiGe layer is equal to or greater than 10%, implanting H<sub>2</sub><sup>+</sup> ions through the SiGe layer into the substrate at a dose of between about 2x10<sup>14</sup> cm<sup>-2</sup> to 2x10<sup>16</sup> cm<sup>-2</sup>, at an energy of between about 20 keV to 100+ keV; low temperature thermal annealing at a 5 temperature of between about 200°C to 400°C for between about ten minutes and ten hours; high temperature thermal annealing the substrate and SiGe layer, to relax the SiGe layer, in an inert atmosphere at a temperature of between about 650°C to 1000°C for between about 30 seconds and 10 30 minutes; and depositing a layer of silicon-based material on the relaxed SiGe layer to a thickness of between about 5 nm to 30 nm.